SOUTH COAST AIR QUALITY MANAGEMENT DISTRICT

Draft Socioeconomic Report for Proposed Rule 2449—Control of Oxides of Nitrogen Emissions from Off-road Diesel Vehicles

April 2008

Executive Officer
Barry R. Wallerstein, D.Env.

Deputy Executive Officer
Planning, Rule Development and Area Sources
Elaine Chang, DrPH

Assistant Deputy Executive Officer
Planning, Rule Development and Area Sources
Laki Tisopulus, Ph.D., P.E.

Director, Strategic Initiative
Planning, Rule Development and Area Sources
Jill Whynot

Author: Sue Lieu, Program Supervisor
Randall Pasek, Program Supervisor

Technical Assistance: Michael Geller, Air Quality Specialist

Reviewed By: Henry Hogo, Assistant Deputy Executive Officer
Zorik Pirveysian, Planning and Rules Manager
Kurt Wiese, District Counsel

SOUTH COAST AIR QUALITY MANAGEMENT DISTRICT

GOVERNING BOARD

Chairman: WILLIAM A. BURKE, Ed.D.
Speaker of the Assembly Appointee

Vice Chairman: S. ROY WILSON, Ed.D.
Supervisor, Fourth District
Riverside County Representative

MEMBERS:

MICHAEL D. ANTONOVICH
Supervisor, Fifth District
Los Angeles County Representative

MICHAEL A. CACCIOTTI
Mayor, City of South Pasadena
Cities of Los Angeles County, Eastern Region

BILL CAMPBELL
Supervisor, Third District
Orange County Representative

JANE W. CARNEY
Senate Rules Committee Appointee

RONALD O. LOVERIDGE
Mayor, City of Riverside
Cities Representative, Riverside County

JOSEPH K. LYOU, Ph.D.
Governor's Appointee

GARY OVITT
Supervisor, Fourth District
San Bernardino County Representative

JAN PERRY
Councilmember, Ninth District
City of Los Angeles

MIGUEL PULIDO
Mayor, City of Santa Ana
Cities Representative, Orange County

TONIA REYES URANGA
Councilmember, City of Long Beach
Cities Representative, Los Angeles County, Western Region

DENNIS YATES
Mayor, City of Chino
Cities of San Bernardino County Representative

EXECUTIVE OFFICER:
BARRY R. WALLERSTEIN, D.Env.

EXECUTIVE SUMMARY

Proposed Rule 2449—Control of Oxides of Nitrogen Emissions from Off-road Diesel Vehicles—will implement by reference the Surplus Off-Road Opt-in for NOx (SOON) Program [Title 13, California Code of Regulation (CCR), Section 2449.3 et seq.]. The SOON Program allows air districts to opt-in to the provision to obtain additional NOx reductions beyond those required by the state regulation (Title 13, CCR, Section 2449) by offering incentive monies for off-road engine repower and retrofit, and vehicle replacements.

The socioeconomic impact of the SOON program relative to the existing state regulation (Title 13, CCR, Section 2449) was analyzed and is summarized below.

Elements of the Proposed Rule	Proposed Rule 2449 will implement the SOON Program, which requires large operators of off-road engines and vehicles with more than 40 percent Tier 0 and Tier 1 equipment in their fleet population to go beyond the NOx reductions called for by the state regulation (Title 13, CCR, Section 2449). As part of the SOON Program, affected operators may apply for funding assistance in achieving additional NOx reductions. If awarded, the operators must complete their NOx reduction projects. The total funding for the SOON Program is anticipated to be $120 million from 2008 to 2011. PR 2449 will result in 12 tons per day of NOx reductions by 2014.
Affected Facilities and Industries	Approximately 1,300 off-road vehicles (i.e., bulldozers, loaders, scrapers, etc.) at 100 to 150 facilities will be affected. Of the 1,300 vehicles, 72 percent belong to the construction industry and the remaining 28 percent belong to the industries of mining (12 percent), utilities (8 percent), waste management (landfill and recycling, 3 percent), and government (5 percent).
Assumptions of Analysis	Two scenarios are developed to evaluate the potential range of compliance cost of PR 2449. Each scenario is evaluated relative to a base case where PR 2449 is not implemented and the $120 million Carl Moyer Memorial Air Quality Standards Attainment Program (Moyer Program) funding will instead be used for other on- and off-road projects and the 1,300 off-road engines will be required to comply with the state base regulation for these engines in the future. Scenario 1 assumes that PR 2449 accelerates the rebuild of the 1,300 engines. Therefore, engine owners will have to pay for the rebuild in order to obtain the Moyer funding. Scenario 2 assumes that the rebuild of the 1,300 engines coincides with the implementation schedule of PR 2449 and is thus considered a normal business practice at no

	additional cost to engine owners. The SOON Program essentially incentivizes early turnover of approximately 1,300 engines in off-road vehicles. The benefit to the owners is that for these engines their compliance with the statewide regulation (Title 13, CCR, Section 2449) will be extended for approximately three years.
Compliance Cost	The compliance cost is lower under the SOON Program than what would otherwise occur. Under Scenario 1, the average annual compliance cost between 2008 and 2012 is $26.8 million for the SOON Program and $25 million for the base case. The difference is mainly due to the off-road engine rebuild cost to engine owners and different engine mixes in the Moyer Program. The average annual cost (2018-2025) of complying with the state off-road regulation is $18.4 million under the SOON Program and $20.2 million during the 2015-2025 period under the base case. The difference is due to the three year extension in implementation of the state regulation for the off-road engines subject to the SOON Program, in addition to the carryover cost of rebuild in 2013 and 2014 under the normal rebuild schedule in the base case. Under Scenario 2, the average annual compliance cost between 2008 and 2012 is $24.9 million for the SOON program and $25 million for the base case. The minor difference is due to different engine mixes in the Moyer Program. The average annual cost (2018-2025) of complying with the CARB off-road regulation is $15.2 million under the SOON Program and $16.3 million under the base case. The difference is due to the three year extension in implementation of the state regulation for the off-road engines subject to the SOON Program.
Job Impacts	PR 2449 is projected to result in fewer forgone jobs than the base case under both scenarios. Under Scenario 1, PR 2449 is projected to result in 317 jobs forgone, on average, between 2008 and 2025. The jobs forgone for the base case are estimated to be 449. Under Scenario 2, PR 2449 is projected to result in 240 jobs forgone, on average, between 2008 and 2025. The jobs forgone for the base case are estimated to be 381. The wholesale, construction, and manufacturing industries are projected to gain jobs during the years when investments in repowering, retrofit, or replacement are made.

Competitiveness Impacts	The impacts on the cost of production are more pronounced in later than earlier (2008-2011) years because the affected industries will have to pay the incremental repowering cost on their own in order to comply with the state off-road regulation. The industries with higher cost impacts tend to have relatively large increases in the relative cost of production. It is projected that the highest increase in the cost of production would occur in the mining industry at no more than six-hundreds of one percent relative to its counterpart in the rest of the U.S. for either the SOON Program or the base case under both scenarios. Seventy-two percent of the affected 1,300 off-road engines belong to the construction industry. The construction industry is projected to face higher increases in relative delivered prices than the rest of the industries. The highest percentage increase in delivered prices in the construction industry is no more than three-hundredths of one percent relative to its counterpart in the rest of the U.S. for either the SOON Program or the base case under both scenarios.
Fleet Specific Analysis	An economic assessment was performed on 18 individual fleets that would be subject to PR 2449. The cost difference of complying with the CARB's base In-use Off-Road Diesel Vehicle regulation with and with out implementation of PR 2449 (SOON Program) was calculated for each fleet. Most fleets showed a positive benefit (cost savings) with implementation of PR 2449 over the full life of the regulation. Most fleets showed an increase in compliance costs with PR 2449 implemented in the early years of the regulation because of early "cast flows" needed to complete SOON funded projects and potential need to identify additional vehicles to meet the state regulation. However, in the later years, cost savings from compliance with PR 2449 were significantly greater than the earlier increase in compliance costs resulting in overall costs savings to fleets. PR 2449 will likely result in benefits (cost savings) to a significant majority of the fleets subject to the rule.

INTRODUCTION

Proposed Rule 2449—Control of Oxides of Nitrogen Emissions from Off-road Diesel Vehicles—will implement by reference the Surplus Off-Road Opt-in for NOx (SOON) Program [Title 13, California Code of Regulation (CCR), Section 2449.3]. The SOON Program allows California air districts to opt-in to the provision to obtain additional NOx reductions beyond those required by the state regulation (Title 13, CCR, Section 2449 et seq.) by offering incentive monies for off-road engine repower and retrofit, and vehicle replacements. Large off-road equipment operators with over 40 percent Tier 0 and Tier 1 equipment would be required to apply for funding. If awarded, these operators must implement the project as described in the application. Funding of $30 million per year for four years (2008-2011) at a total of $120 million from the Carl Moyer Memorial Air Quality Standards Attainment Program (Moyer Program) is proposed for the SOON Program.

The socioeconomic assessment herein analyzes the impact of the proposed rule. The impact is compared to the impact of the base case where the SOON Program is assumed not to be implemented and the $120 million funding in the Moyer Program will be used for other projects.

REGULATORY HISTORY

The California Air Resources Board (CARB) adopted the Emission Standards for In-Use Off-Road Diesel-Fueled Fleets regulation in July 2007. The regulation requires that off-road diesel engine and equipment owners meet increasingly more stringent PM and NOx fleet average emission targets or perform minimum vehicle turnover and retrofit requirements each year between 2010 and 2025 depending on the size of the fleet. Under the SOON provision of the regulation additional NOx reductions based on the more stringent NOx targets can be achieved through incentive funding.

The Moyer Program was established to fund surplus emission reductions (i.e., emission reductions beyond any federal, state, or local rule or regulation) for the incremental cost of the cleaner equipment. The Program covers a variety of on- and off-road equipment. The Program is funded by a $2 for vehicle registration, $1 to $1.75 for each new tire purchased, and $6 to $12 for smog abatement fee while extending the new vehicle smog check exemption. The AQMD has adopted specific policies and procedures to implement the Moyer Program. The policies and procedures for the implementation of the Moyer Program serve as the basis for the implementation of the SOON program. Additional administrative guidelines to implement the SOON Program are proposed to implement PR 2449.

LEGISLATIVE MANDATES

The socioeconomic assessments at the AQMD have evolved over time to reflect the benefits and costs of regulations. The legal mandates directly related to the assessment of the proposed rule include the AQMD Governing Board resolutions and various sections of the California Health & Safety Code (H&SC).

AQMD Governing Board Resolutions

On March 17, 1989, the AQMD Governing Board adopted a resolution that calls for preparing an economic analysis of each proposed rule for the following elements:

- Affected Industries
- Range of Control Costs
- Cost Effectiveness
- Public Health Benefits

On October 14, 1994, the Board passed a resolution which directed staff to address whether the rules or amendments brought to the Board for adoption are in the order of cost effectiveness as defined in the AQMP. The intent was to bring forth those rules that are cost effective first.

Health & Safety Code Requirements

The state legislature adopted legislation that reinforces and expands the Governing Board resolutions for socioeconomic assessments. H&SC Sections 40440.8(a) and (b), which became effective on January 1, 1991, require that a socioeconomic analysis be prepared for any proposed rule or rule amendment that *"will significantly affect air quality or emissions limitations."* Specifically, the scope of the analysis should include:

- Type of Affected Industries
- Impact on Employment and the Economy of the district
- Range of Probable Costs, Including Those to Industries
- Emission Reduction Potential
- Necessity of Adopting, Amending or Repealing the Rule in Order to Attain State and Federal Ambient Air Quality Standards
- Availability and Cost Effectiveness of Alternatives to the Rule

Additionally, the AQMD is required to actively consider the socioeconomic impacts of regulations and make a good faith effort to minimize adverse socioeconomic impacts. H&SC Section 40728.5, which became effective on January 1, 1992, requires the AQMD to:

- Examine the Type of Industries Affected, Including Small Businesses; and
- Consider Socioeconomic Impacts in Rule Adoption

H&SC Section 40920.6, which became effective on January 1, 1996, requires that incremental cost effectiveness be performed for a proposed rule or amendment relating to ozone, carbon monoxide (CO), oxides of sulfur (SO_x), oxides of nitrogen (NO_x), and their precursors. Incremental cost effectiveness is defined as the difference in costs divided by the difference in emission reductions between one level of control and the next more stringent control.

AFFECTED INDUSTRIES

The proposed rule will affect California owners and/or operators of off-road vehicles with a fleet size over 20,000 horsepower (hp) that have more than 40 percent Tier 0 and Tier 1 off-road vehicles in their fleet population as of January 1, 2008, and have the majority of their operations in the AQMD. It is estimated that 100-150 fleets (facilities) will be affected as a result. Currently, there are 3,200 fleets operating in the AQMD. While small in number, these 100-150 largest fleets constitute more than 80 percent of the approximate 11 million hp of off-road diesel vehicles in the AQMD. On average, these largest fleets are comprised of 300-350 vehicles (i.e., bulldozers, loaders, scrapers, etc.), averaging approximately 250-275 hp each (CARB, 2007a).

To meet the AQMD's 2014 NOx reduction goal to comply with the $PM_{2.5}$ standard, approximately 520,000 hp of off-road diesel equipment must be repowered, which equates to an average of about 4,000 hp (or about 10 to 15 vehicles) per fleet over the 4 year period (2008-2011) when SOON funding will be available. Because of the design of the SOON Program, it is expected that fleet owners will choose to repower the larger, older vehicles and for this analysis it is assumed that 1,300 vehicles with an average size of 400 hp will be repowered during the 4 years the SOON funding will be available. This will result in less than 5 percent of the vehicles in a fleet being affected by the SOON Program.

Of the 1,300 vehicles, 72 percent belong to the construction industry and the remaining 28 percent belong to the industries of mining (12 percent), utilities (8 percent), waste management (landfill and recycling, 3 percent), and government (5 percent).

Small Businesses

The AQMD defines a "small business" in Rule 102 as one which employs 10 or fewer persons and which earns less than $500,000 in gross annual receipts. In addition to the AQMD's definition of a small business, the federal Small Business Administration (SBA), the federal Clean Air Act Amendments (CAAA) of 1990, and the California Department of Health Services (DHS) also provide definitions of a small business.

The SBA's definition of a small business uses the criteria of gross annual receipts (ranging from $0.5 million to $25 million), number of employees (ranging from 100 to 1,500), megawatt hours generated (4 million), or assets ($150 million), depending on industry type. The SBA definitions of small businesses vary by 6-digit North American Industrial Classification System (NAICS) code.

The CAAA classifies a facility as a "small business stationary source" if it: (1) employs 100 or fewer employees, (2) does not emit more than 10 tons per year of either VOC or NOx, and (3) is a small business as defined by SBA.

Since individual facilities affected by Proposed Rule 2449 are defined by total horsepower (i.e., 20,000 hp and above), there may be facilities defined as small businesses. However, given the

provisions of PR 2449, the small business status will not be known until compliance plans are submitted.

COMPLIANCE COST

Two scenarios are developed to evaluate the compliance cost of PR 2449. Each scenario is evaluated relative to a base case where PR 2449 is not implemented and the $120 million Moyer funding will instead be used for other projects and the 1,300 off-road engines will be required to comply with the CARB base regulation for these engines in the future.

PR 2449 implements, by reference, the SOON provisions of CARB's in-use off-road diesel vehicle regulation. The SOON program is designed to offer fleets incentive funding to achieve additional NOx reductions above those achieved through CARB's base regulation. Moyer Program funds are the source of the SOON incentive funds and their use is regulated by Moyer guidelines developed by CARB and the AQMD. The development of the guidelines assumed that SOON (Moyer) funded projects will be at or near their normal engine rebuild cycle. Costs associated with the engine rebuild are not included in Moyer funded repower projects where equipment is fitted with newer, cleaner engines as they would have been incurred by the fleets in any case. PR 2449 will result in 12 tons per day of NOx reductions by 2014.

The SOON Program is designed slightly differently from the traditional Moyer Program and requires eligible fleets to apply for funding to repower vehicles that are not needed to comply with the CARB's base regulation (i.e., are surplus – Moyer funding can only be used to obtain surplus emission reductions). Because of this requirement, it is possible that some of the vehicles that receive SOON funding may not be near their normal rebuild time when they receive SOON funding, and because the SOON funding does not include the cost of the rebuild when a vehicle is repowered, the fleet owner will essentially bear the cost for a rebuild sooner than its normal operation.

To better understand the effects of this additional cost on fleet owners, two scenarios were developed to reasonably assess the economic impacts of PR 2449. Scenario 1 assumes that PR 2449 causes the 1,300 engines to incur the additional cost due to a rebuild which would not occur otherwise (i.e., all SOON funded engines were not near their normal rebuild cycle when funded). Therefore, engine owners will have to incur the rebuild cost in order to obtain the Moyer funding. Scenario 2 assumes that the rebuild of the 1,300 engines coincides with the implementation schedule of PR 2449 and is thus considered a normal business practice and will result in no additional cost to engine owners.

Under both scenarios, it is assumed that 325 engines in off-road diesel vehicles would be repowered annually from 2008 to 2011 under the SOON Program. The cost of repowering varies by engine size. The average incremental (capital) cost—funded by the Moyer Program—of repowering an engine in an off-road diesel vehicle is estimated to be $92,000, assuming an average of about 400 hp (CARB, 2008).

There will be a lapse time between entering a contract with a vendor for repowering and receiving funds from the Moyer Program. It is assumed that the lapse time is six months and owners of the off-road vehicles will exercise a line of credit at the prime rate (six percent on February 13, 2008) plus two percent to cover the cost of repowering during the six-month period.[1] The total interest payment would be $1.2 million for repowering 325 engines. It is also assumed that for each repowered engine, its owner will incur an additional $100 administrative cost (funding application preparation and compliance plan reporting). This amounts to $32,500 per year from 2008 to 2011.

The SOON provision requires that a fleet (facility) identify engines that could provide surplus emission reductions to the statewide regulation (i.e., engines not needed to be modified or replaced to meet the NOx requirements of the regulation during the SOON contract life). Should the vehicle receive SOON funding and implement NOx reduction projects (e.g., repowering), the engine's pre-modified emission levels must be assumed for the length of the SOON contract period (7 years) for the purpose of demonstrating compliance with the state regulation. At the conclusion of the contract, the engine's actual emission levels can then be used to determine compliance with the base regulation. This requirement ensures that the fleet's emissions reductions under the SOON Program are surplus to those that would have occurred under the state regulation. For example, if SOON funding is used to repower a Tier 0 (uncontrolled) engine to a Tier 3 (cleanest technology available) engine in 2008, the Tier 0 emission levels will be used for that engine to determine the fleet's compliance with the state regulation each year through 2014. In 2015 the engine's actual emission level (Tier 3) will be used to determine compliance with the state regulation, and, as such, the engine will now not need to be modified until 2018 or later. Without the SOON funding the fleet owner would have had to modify the engine in 2015. This extension in modifying the engine yields cost savings for the fleet owner when compared to engines that did not receive SOON funding.

Existing Moyer Program

Table 1 shows the projects on which the $120 million funding under the Moyer Program from 2008 to 2011 is expected to be spent if the SOON Program is not adopted. The information on funding in Table 1 is based on similar projects funded in the past. It is possible that the funding level for each category may vary. In 2008, the $30 million funding is assumed to be used for trucks and school buses only. Every year from 2009 to 2011, the $30 million will be spent on a variety of projects.

[1] http://www.bankrate.com/brm/ratewatch/leading-rates.asp.

Table 1
Moyer Program Funding by Category without SOON

Funding Category	Unit Cost	2008		2009-2011	
		Unit	Funding	Unit	Funding
On-road LNG Truck Replacement	$30,000	500	$15,000,000		
On-road Trucks (PM) Retrofit	$11,000			340	$3,740,000
On-road Trucks (PM+NOx) Retrofit	$20,000			60	$1,200,000
Ammonia for On-road Trucks	$1,000			60	$60,000
Construction Repower	$78,900			38	$3,000,000
Construction Retrofit	$20,000			50	$1,000,000
Marine Vessel Repower	$400,000			5	$2,000,000
Locomotive Repower	$750,000			4	$3,000,000
Transit Bus Repower	$20,000			250	$5,000,000
Ag Pump Replacement	$29,400			17	$500,000
Truck APU Retrofit	$5,000			300	$1,500,000
Cargo Handling Equip Retrofit	$100,000			50	$5,000,000
School Bus Replacement	$135,000	89	$12,015,000	24	$3,240,000
School Bus Retrofit	$19,900	150	$2,985,000	38	$760,000
Total			$30,000,000		$30,000,000

Except for school buses where the Moyer funding is dispensed immediately, the lapse time between entering a contract with a vendor for repowering, retrofit, or replacement and receiving funds from the Moyer Program is assumed to be six months, during which equipment owners will exercise a line of credit at the prime rate plus two percent to cover the interim cost. The total interest payment would be $0.6 million in 2008 and $1 million per year from 2009-2011. Furthermore, each vehicle owner will incur an additional $100 per vehicle to work with consultants on administering the Moyer Program. This amounts to $73,900 in 2008 and $95,400 per year from 2009 to 2011. Finally, for each school bus replaced under the Moyer Program, the subject school district will spend $25,000 to help defray the replacement cost.

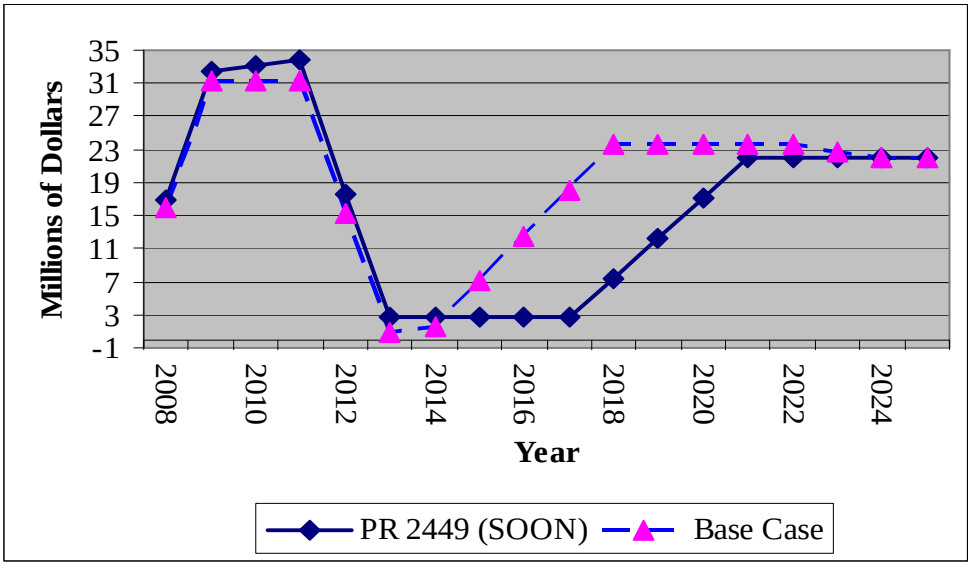
Scenario 1

Scenario 1 assumes that the 1,300 off-road engine owners will have to bear the rebuild cost ($16,000 per engine approximately) prior to obtaining the Moyer funding for the incremental cost of repowering ($92,000 per engine) because these engines were not near their normal rebuild cycle at the time of required repowering under the SOON Program. These same engines will then have to be repowered to the Tier 4 standard beginning in 2018 in order to comply with the CARB regulation for in-use off-road diesel vehicles.

This scenario is evaluated against a base case where the $120 million Moyer funding is used for the projects shown in Table 1 and the 1,300 engines, as a result of the fleets' normal business practices, will not be rebuilt until 2013. It is assumed that 325 engines would be rebuilt each year in 2013 and 2014, respectively. Beginning in 2015, all the 1,300 engines will need to comply with the CARB regulation, at a rate of 325 engines per year from 2015 to 2018, and be

repowered to the Tier 4 standard. The total cost to repower a vehicle with a Tier 4 engine is assumed to be $138,000 per engine. Figure 1 shows the costs of the SOON Program and the base case from 2008 to 2025. From 2008 to 2014, PR 2449 is projected to have a higher compliance cost than the base case. However, the cost of the SOON Program will be lower than that of the base case starting in 2015. The costs of the SOON Program and the base case will converge in 2024 and thereafter.

Figure 1
Scenario 1: Cost of Compliance by Year (PR 2449 and Base Case)



SOON Program

Table 2 shows the cost of the SOON Program by industry for selected years over the period of 2008 to 2025. The cost between 2008 and 2012 also reflects the additional rebuild cost to engine owners, the 6-month lapse time between entering a contract for repowering and receiving the Moyer funding, as well as the cost of administering the Moyer Program (working with a consultant). The majority of the cost during this period is borne by consumers—the source of the Moyer funding. From 2018 to 2025, the majority of the cost will accrue to the construction industry based on annualizing the total repowering cost (including rebuild) to a more stringent standard at a four-percent real interest rate and 10-year equipment life.

Table 2
Scenario 1: Cost of SOON Program by Industry (in millions of dollars)*

Industry	2008	2011	Average Annual (2008-12)	2018	2021	Average Annual (2018-25)
Construction	$1.355	$2.759	$2.020	$5.372	$15.869	$13.245
Utilities	0.148	0.302	0.221	0.588	1.736	1.449
Mining	0.233	0.474	0.347	0.923	2.727	2.276
Waste Management	0.063	0.129	0.095	0.252	0.744	0.621
Government	0.085	0.172	0.126	0.336	0.992	0.828
Consumer	15.000	30.000	24.000	0.000	0.000	0.000
Total	**$16.884**	**$33.837**	**$26.809**	**$7.470**	**$22.068**	**$18.418**

*The cost here also includes the compliance cost of the 1,300 off-road engines under the state regulation with the compliance date extended for three years. The net cost of adopting the SOON Program is the cost difference between Tables 2 and 3.

Base Case

Table 3 shows the cost of the existing Moyer Program by industry for selected years between 2008 and 2012. The 2008-2012 cost also reflects the 6-month lapse time between entering a contract for repowering and receiving the Moyer funding (except for school buses where the Moyer funding is dispensed immediately), the cost of hiring a contractor to administer the Moyer Program (funding application and annual reporting), as well as the school co-payment for school bus replacement. The cost between 2015 and 2021 reflects the compliance cost under the CARB regulation (Title 13, CCR, Section 2449) for the 1,300 off-road engines, in addition to the carryover cost of rebuild in 2013 and 2014 under the normal business practice. The majority of the cost will accrue to the construction industry during this period.

Table 3
Scenario 1: Cost of Base Case by Industry (in millions of dollars)

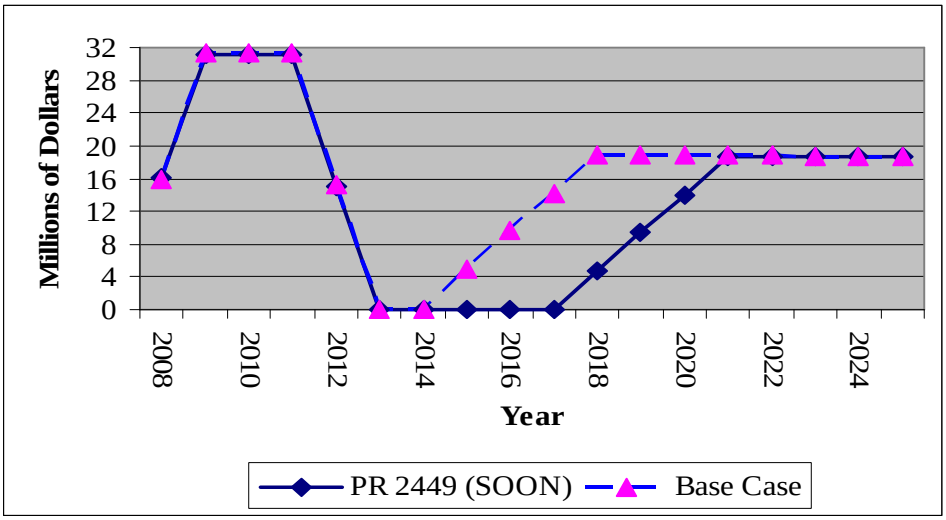
Industry	2008	2011	Average Annual (2008-12)	2015	2021	Average Annual (2015-25)
Mining	$0.000	$0.000	$0.000	$0.843	$2.888	$2.480
Utilities	0.000	0.000	0.000	0.536	1.838	1.578
Construction	0.000	0.169	0.101	4.904	16.805	14.429
Rail Transportation	0.000	0.120	0.072	0.000	0.000	0.000
Water Transportation	0.000	0.286	0.171	0.000	0.000	0.000
Truck Transportation	0.650	0.328	0.327	0.000	0.000	0.000
Transit	0.000	0.203	0.122	0.000	0.000	0.000
Waste Management	0.000	0.000	0.000	0.230	0.788	0.676
Educational Services	0.224	0.217	0.215	0.211	0.211	0.153
Farm	0.000	0.022	0.013	0.000	0.000	0.000
Government	0.000	0.000	0.000	0.306	1.050	0.902
Consumer	15.000	30.000	24.000	0.000	0.000	0.000
Total	**$15.874**	**$31.344**	**$25.021**	**$7.030**	**$23.581**	**$20.218**

Scenario 2

Under Scenario 2, the rebuilt of the 1,300 off-road engines is assumed to coincide with the PR 2449 requirements. As such, the rebuild cost is considered a normal business practice, and will result in no additional cost to the owners of these engines. The incremental cost of repowering will be entirely paid for by the Moyer Program. In 2018, when the 1,300 engines have to be repowered to the Tier 4 standard to comply with the CARB regulation, the rebuild cost at that time is also considered a normal business practice, and will result in no additional cost to the engine owners. However, the engine owners will assume the burden of cost difference ($117,000 per engine) between repowering and rebuild.

Scenario 2 is also evaluated with respect to a base case where the $120 million Moyer funding is used for projects delineated in Table 1 and the 1,300 engines will begin to comply with the CARB off-road regulation in 2015, at a rate of 325 engines per year, between 2015 and 2018. The rebuild cost is considered a normal business practice and thus only the incremental repowering cost ($117,000) is used in the assessment. Figure 2 shows the costs of the SOON Program and the base case from 2008 to 2025, which is very similar between 2008 and 2012, displays the cost delay impacts between 2015 and 2020, and is identical beginning in 2021.

Figure 2
Scenario 2: Cost of Compliance by Year (PR 2449 and Base Case)



SOON Program

Table 4 shows the cost of the SOON program by industry for selected years over the period of 2008 to 2025. The cost between 2008 and 2012 also reflects the 6-month lapse time between entering a contract for repowering and receiving the Moyer funding as well as the cost of administering the Moyer Program (working with a consultant). The majority of the 2008-2012 cost is paid for by consumers through vehicle licensing and tire fees. The 2018-2025 cost

reflects the requirements of the CARB regulation by assuming that one-quarter of the 1,300 engines will be repowered every year between 2018 and 2021. The majority of the cost during this period will accrue to the construction industry.

Table 4
Scenario 2: Cost of SOON Program by Industry (in millions of dollars)*

Industry	2008	2011	Average Annual (2008-12)	2018	2021	Average Annual (2018-25)
Construction	$0.886	$0.886	$0.709	$3.372	$13.489	$10.959
Utilities	0.097	0.097	0.078	0.369	1.475	1.199
Mining	0.000	0.000	0.000	0.580	2.318	1.884
Waste Management	0.042	0.042	0.033	0.158	0.632	0.514
Government	0.055	0.055	0.044	0.211	0.811	0.661
Consumer	15.000	30.000	24.000	0.000	0.000	0.000
Total	**$16.081**	**$31.081**	**$24.865**	**$4.689**	**$18.726**	**$15.217**

*The cost here also includes the compliance cost of the 1,300 off-road engines under the state regulation with the compliance date extended for three years. The net cost of adopting the SOON Program is the cost difference between Tables 4 and 5.

Base Case

If the SOON Program is not adopted, the $120 million Moyer funding will be used for projects in Table 1 and the 1,300 off-road engines would be required to comply with the CARB regulation (Title 13, CCR, Section 2449) beginning in 2015. The cost between 2008 and 2012 in Table 5 shows the cost of the existing Moyer Program by industry. The cost also reflects the 6-month lapse time between entering a contract for repowering and receiving the Moyer funding (except for school buses where the Moyer funding is dispensed immediately), the cost of hiring a contractor to administer the Moyer Program (funding application and annual reporting), as well as the school co-payment for school bus replacement. The cost between 2015 and 2021 reflects the compliance cost under the CARB regulation (Title 13, CCR, Section 2449) for the 1,300 off-road engines. The majority of the cost will accrue to the construction industry based on annualizing the incremental capital cost of repowering (excluding rebuild cost) at a four-percent real interest rate and 10-year equipment life.

Table 5
Scenario 2: Cost of Base Case by Industry (in millions of dollars)

Industry	2008	2011	Average Annual (2008-12)	2015	2021	Average Annual (2015-25)
Mining	$0.000	$0.000	$0.000	$0.580	$2.318	$2.002
Utilities	0.000	0.000	0.000	0.369	1.475	1.274
Construction	0.000	0.169	0.101	3.372	13.489	11.649
Rail Transportation	0.000	0.120	0.072	0.000	0.000	0.000
Water Transportation	0.000	0.286	0.171	0.000	0.000	0.000
Truck Transportation	0.650	0.328	0.327	0.000	0.000	0.000
Transit	0.000	0.203	0.122	0.000	0.000	0.000
Waste Management	0.000	0.000	0.000	0.158	0.632	0.546
Educational Services	0.224	0.217	0.215	0.211	0.211	0.153
Farm	0.000	0.022	0.013	0.000	0.000	0.000
Government	0.000	0.000	0.000	0.211	0.811	0.702
Consumer	15.000	30.000	24.000	0.000	0.000	0.000
Total	$15.874	$31.344	$25.021	$4.900	$18.936	$16.327

JOBS AND OTHER SOCIOECONOMIC IMPACTS

The macroeconomic impact of PR 2449 is examined via the REMI model. The model (version 9.0.3) is used to assess the total socioeconomic impacts of a policy change. The model links the economic activities in the counties of Los Angeles, Orange, Riverside, and San Bernardino. The REMI model for each county is comprised of a five block structure that includes (1) output and demand, (2) labor and capital, (3) population and labor force, (4) wages, prices and costs, and (5) market shares. These five blocks are interrelated. Within each county, producers are made up of 66 private non-farm industries, three government sectors, and a farm sector. Trade flows are captured between sectors and borders as well as across counties and the rest of U.S. Market shares of industries are dependent upon their product prices, access to production inputs, and local infrastructure. The demographic/migration component has 160 ages/gender/race/ethnicity cohorts and captures population changes in births, deaths, and migration.

The assessment herein is performed relative to a base case without Proposed Rule 2449 (SOON). Direct effects of the SOON Program and the base case, respectively, have to be assessed and used as inputs to the REMI model in order for the model to assess the total (direct, secondary, and induced) impacts for all the actors in the four-county economy on an annual basis and across a user-defined horizon (2008 to 2025).

Direct effects of the SOON Program are the additional sales of rebuild parts, repowering equipment and the associated installation cost, the cost of administering the Moyer Program, the interest payment on the line of credit, and the forgone consumer expenditures (vehicle licensing and tire fees in the Moyer Program).[2] Additional parts and equipment sales as well as installation will benefit the industries of wholesale trade, machinery manufacturing, and construction, respectively (installation is assumed to be one-third of the incremental repowering

[2]The forgone expenditure is also modeled in the base case.

cost). Owners of off-road equipment will work with the professional and technical services industry on the administration of the Moyer Program, thus resulting in additional sales for this industry. The bulk of the cost associated with repowering will be paid for by consumers except for the interest on short-term loans used to start up repowering projects prior to being fully reimbursed by the Moyer Program. The rebuild, interest payment, and administration of the Moyer Program will constitute an additional cost of doing business for the owners of off-road vehicles. The additional expenditures and sales are allocated to the four counties based on the population, employment, or output in each county. In 2018, as the engines under the SOON program begin to comply with the CARB regulation on off-road engines, the owners of these engines will be solely responsible for the total cost of meeting the more stringent standard under this regulation.

Under the base case, the Moyer funding will be allocated to a number of on- and off-road equipment categories based on similar projects funded historically. The owners of the equipment (respective industries such as the sector of truck transportation for truck APU retrofit) will face the additional cost of doing business for the interest on their short-term loans and the administration of the Moyer Program, in addition to their share of the co-payment. The additional cost of doing business (for the operators with equipment in Table 1) is distributed to the four counties based on sectoral employment (e.g., the sector of educational services for school buses), cash value of crop and livestock for agricultural pumps, and the number of rail yards for locomotives. The industries of machinery manufacturing, motor vehicle manufacturing, construction, and professional and technical services will benefit from the additional demand for their products and services.[3] In later years, the compliance of the off-road engines with the CARB regulation (assuming the SOON program is not adopted) will lead to additional cost of doing business to the owners of these engines and additional demand for the products and services provided by the industries of machinery manufacturing and construction. These direct effects are distributed to the four counties according to their population.

Job Impacts of Scenario 1

PR 2449 is projected to result in fewer forgone jobs than the base case. Tables 6 and 7 show the job impacts by industry for PR 2449 and the base case relative to the baseline economic projection in the four-county area between 2008 and 2025. PR 2449 is projected to result in 317 jobs forgone, on average, between 2008 and 2025 while the jobs forgone for the base case are estimated to be 449. The construction, manufacturing, and wholesale trade industries are projected to gain jobs during the years when investments in repowering, retrofit, or replacement are made (2008-2011 and 2013-2018 for the base case; and 2008-2011 and 2018-2021 for PR 2449). Job impacts between PR 2449 and the base case during the period of 2008-2011 reflect the differences in investment projects between off-road engines under SOON (repowering only) and those in Table 1 (repowering, retrofit, and replacement). Repowering would result in more investment expenditures to stay local than retrofit and replacement projects and thus more positive job impacts. This is because installation and parts required for repowering can be supplied locally while the majority of suppliers of retrofit and replacement engines are outside of

[3] As with the SOON case, the construction industry benefits from installation associated with repowering. No installation cost is assumed for engine or vehicle retrofit and replacement.

southern California. Therefore, on average, there are fewer jobs forgone under the SOON Program than under the base case as more positive jobs offset negative jobs from the additional cost of doing business. The job impacts during 2018-2021 for PR 2449 are similar to those during 2015-2018 for the base case because PR 2449 would allow engines to extend their compliance with the CARB off-road regulation by three years. Additionally, there are some carryover cost impacts of off-road engine rebuild from 2013-2014 under the normal business practice for the base case.

Table 6
Scenario 1: Job Impact of PR 2449 by Industry

Employment	2009	2011	2021	2022	Average Annual (2008-2025)	Average Annual Baseline (2008-2025)*
Forestry, Fishing, Other	0	0	-1	-1	0	22,721
Mining	0	0	-2	-2	-1	11,332
Utilities	-1	-2	-2	-3	-1	30,436
Construction	53	32	31	-79	-1	587,075
Manufacturing	13	6	-10	-48	-11	794,943
Wholesale Trade	12	7	-1	-26	-4	447,779
Retail Trade	-59	-64	-52	-81	-43	1,064,503
Transp, Warehousing	-5	-6	-9	-15	-7	330,663
Information	-5	-6	-11	-15	-7	360,778
Finance, Insurance	-18	-21	-30	-40	-20	487,434
Real Estate, Rental, Leasing	-13	-18	-48	-58	-28	547,750
Profess, Tech Services	-11	-17	-38	-63	-27	938,220
Mngmt of Co., Enterprises	-1	-2	-4	-7	-3	134,237
Admin, Waste Services	-15	-21	-41	-63	-28	875,912
Educational Services	-14	-15	-18	-25	-13	267,332
Health Care, Social Asst	-29	-34	-30	-44	-26	1,103,126
Arts, Entertain., Recreation	-8	-9	-11	-15	-8	316,844
Accom, Food Services	-43	-46	-46	-64	-33	784,267
Other Services (excl Gov)	-34	-37	-38	-52	-27	675,963
Government	-11	-25	-37	-44	-30	1,157,109
Total	-190	-278	-398	-745	-317	10,964,974

*The total is not the same as the sum of individual sectors since the farm sector is not included.
The sum of individual numbers may not be the same as the total due to rounding.

Table 7
Scenario 1: Job Impact of Base Case by Industry

Employment	2009	2011	2018	2022	Average Annual (2008-2025)	Average Annual Baseline (2008-2025)*
Forestry, Fishing, Other	0	0	-1	-1	0	22,721
Mining	0	0	-2	-3	-1	11,332
Utilities	-2	-2	-2	-4	-2	30,436
Construction	4	-10	29	-100	-22	587,075
Manufacturing	2	0	-10	-59	-19	794,943
Wholesale Trade	-12	-12	-1	-32	-10	447,779
Retail Trade	-67	-66	-60	-94	-57	1,064,503
Transp, Warehousing	-7	-8	-10	-19	-10	330,663
Information	-5	-5	-12	-18	-9	360,778
Finance, Insurance	-20	-20	-32	-48	-26	487,434
Real Estate, Rental, Leasing	-11	-12	-50	-72	-37	547,750
Profess, Tech Services	-17	-20	-38	-79	-37	938,220
Mngmt of Co., Enterprises	-2	-2	-4	-9	-4	134,237
Admin, Waste Services	-21	-23	-43	-79	-39	875,912
Educational Services	-15	-16	-21	-31	-18	267,332
Health Care, Social Asst	-33	-36	-31	-53	-33	1,103,126
Arts, Entertain., Recreation	-8	-8	-12	-18	-10	316,844
Accom, Food Services	-47	-45	-50	-74	-43	784,267
Other Services (excl Gov)	-37	-36	-42	-58	-35	675,963
Government	-13	-26	-38	-65	-39	1,157,109
Total	-313	-345	-429	-916	-449	10,964,974

*The total is not the same as the sum of individual sectors since the farm sector is not included.
The sum of individual numbers may not be the same as the total due to rounding.

Job Impacts of Scenario 2

PR 2449 is projected to result in fewer forgone jobs than the base case. Tables 8 and 9 show the job impacts by industry for PR 2449 and the base case relative to the baseline economic projection in the four-county area between 2008 and 2025. PR 2449 is projected to result in 240 jobs forgone, on average, between 2008 and 2025 while the jobs forgone for the base case are estimated to be 381. The construction and manufacturing industries are projected to gain jobs during the years when investments in repowering, retrofit, or replacement are made (2008-2011 and 2015-2018 for the base case; and 2008-2011 and 2018-2021 for PR 2449). Job impacts between PR 2449 and the base case during the period of 2008-2011 reflect the differences in investment projects between off-road engines under SOON (incremental cost of repowering only) and those in Table 1 (repowering, retrofit, and replacement). Repowering would result in more investment expenditures to stay local than retrofit and replacement projects. This is because installation and parts required for repowering can be supplied locally while the majority of suppliers of retrofit and replacement engines are outside of southern California, thus resulting in more positive job impacts. Therefore, on average, there are fewer jobs forgone under SOON than under the base case as more positive jobs offset negative jobs from the cost of doing business. The job impacts during 2018-2025 for PR 2449 are similar to those for the base case except that the former are delayed for three years. This is because PR 2449 would allow engines

to extend their compliance with the CARB off-road regulation by three years. For example, there are 320 jobs forgone in 2021 under SOON as opposed to 330 jobs forgone in 2018 under the base case.

Table 8
Scenario 2: Job Impact of PR 2449 by Industry

Employment	2009	2011	2021	2022	Average Annual (2008-2025)	Average Annual Baseline (2008-2025)*
Forestry, Fishing, Other	0	0	0	-1	0	22,721
Mining	0	0	-1	-2	-1	11,332
Utilities	-1	-1	-2	-3	-1	30,436
Construction	55	39	40	-69	8	587,075
Manufacturing	13	10	-3	-39	-5	794,943
Wholesale Trade	-9	-10	-13	-21	-9	447,779
Retail Trade	-59	-57	-44	-69	-34	1,064,503
Transp, Warehousing	-5	-5	-8	-13	-5	330,663
Information	-5	-5	-9	-12	-5	360,778
Finance, Insurance	-18	-18	-24	-34	-15	487,434
Real Estate, Rental, Leasing	-11	-13	-38	-48	-20	547,750
Profess, Tech Services	-12	-15	-30	-51	-20	938,220
Mngmt of Co., Enterprises	-1	-2	-3	-6	-2	134,237
Admin, Waste Services	-16	-19	-34	-52	-21	875,912
Educational Services	-13	-13	-16	-22	-10	267,332
Health Care, Social Asst	-29	-32	-25	-37	-21	1,103,126
Arts, Entertain., Recreation	-8	-8	-9	-13	-6	316,844
Accom, Food Services	-42	-41	-39	-55	-27	784,267
Other Services (excl Gov)	-34	-32	-32	-45	-22	675,963
Government	-11	-22	-28	-34	-23	1,157,109
Total	-206	-243	-320	-623	-240	10,964,974

*The total is not the same as the sum of individual sectors since the farm sector is not included.
The sum of individual numbers may not be the same as the total due to rounding.

Table 9
Scenario 2: Job Impact of Base Case by Industry

Employment	2009	2011	2018	2022	Average Annual (2008-2025)	Average Annual Baseline (2008-2025)*
Forestry, Fishing, Other	0	0	0	-1	0	22,721
Mining	0	0	-1	-3	-1	11,332
Utilities	-2	-2	-2	-3	-2	30,436
Construction	4	-10	44	-81	-13	587,075
Manufacturing	2	0	-3	-48	-14	794,943
Wholesale Trade	-12	-12	-14	-26	-14	447,779
Retail Trade	-67	-66	-46	-77	-49	1,064,503
Transp, Warehousing	-7	-8	-8	-15	-8	330,663
Information	-5	-5	-9	-14	-8	360,778
Finance, Insurance	-20	-20	-25	-39	-22	487,434
Real Estate, Rental, Leasing	-11	-12	-40	-58	-30	547,750
Profess, Tech Services	-17	-20	-30	-64	-31	938,220
Mngmt of Co., Enterprises	-2	-2	-3	-7	-3	134,237
Admin, Waste Services	-21	-23	-35	-64	-33	875,912
Educational Services	-15	-16	-17	-25	-15	267,332
Health Care, Social Asst	-33	-36	-25	-44	-29	1,103,126
Arts, Entertain., Recreation	-8	-8	-10	-15	-8	316,844
Accom, Food Services	-47	-45	-40	-60	-37	784,267
Other Services (excl Gov)	-37	-36	-33	-48	-30	675,963
Government	-13	-26	-32	-54	-34	1,157,109
Total	-313	-345	-330	-746	-381	10,964,974

*The total is not the same as the sum of individual sectors since the farm sector is not included.
The sum of individual numbers may not be the same as the total due to rounding.

Competitiveness Impact of Scenario 1

The additional compliance costs resulting from PR 2449 and the base case would increase the cost of production of the affected industries relative to their national counterparts. Changes in relative production costs would thus be a good indicator of changes in relative competitiveness. The magnitude of the impact depends on the size and diversification of, and infrastructure in a local economy as well as interactions among industries. A large, diversified, and resourceful economy would absorb the impact with relative ease.

Table 10 shows the impacts on the cost of production by industry. An index of 0 indicates that there is no change in the cost of production relative to the rest of the U.S. An index of above or below 0 means that the cost of production in the four-county areas resulting from PR 2449 or the base case is higher or lower, respectively, than that in the rest of U.S. The impacts are larger in later than earlier (2008-2011) years because the affected industries will have to pay the incremental repowering cost beginning in 2015 on their own in order to comply with the CARB off-road regulation. The 2008-2011 impacts are higher and more concentrated in a few industries under SOON than under the base case. The industries with higher cost impacts tend to have relatively large increases in the cost of production. It is projected that the highest increase in the cost of production would occur in the mining industry, for example, at approximately 0.02

percent relative to its counterpart in the rest of the U.S. under SOON and 0.04 percent under the base case in 2019.

Table 10
Scenario 1: Impact on the Cost of Production by Industry

Industry	SOON				Base Case			
	2009	2011	2019	2022	2009	2011	2019	2022
Forestry, Fishing, Other	0.000%	0.000%	0.002%	0.002%	0.000%	0.000%	0.003%	0.003%
Mining	0.005%	0.007%	0.020%	0.033%	0.000%	0.000%	0.037%	0.044%
Utilities	0.002%	0.003%	0.009%	0.015%	0.000%	0.000%	0.017%	0.020%
Construction	0.003%	0.004%	0.012%	0.020%	0.000%	0.000%	0.022%	0.027%
Manufacturing	0.000%	0.000%	0.002%	0.003%	0.000%	0.000%	0.003%	0.004%
Wholesale Trade	0.000%	0.000%	0.002%	0.002%	0.000%	0.000%	0.002%	0.003%
Retail Trade	0.001%	0.001%	0.002%	0.004%	0.000%	0.000%	0.004%	0.005%
Transp, Warehousing	0.000%	0.000%	0.002%	0.002%	0.002%	0.002%	0.003%	0.002%
Information	0.001%	0.001%	0.004%	0.006%	0.000%	0.000%	0.006%	0.008%
Finance, Insurance	0.001%	0.001%	0.003%	0.004%	0.000%	0.000%	0.004%	0.005%
Real Estate, Rental, Leasing	0.001%	0.001%	0.006%	0.009%	0.000%	-0.001%	0.010%	0.012%
Profess, Tech Services	0.000%	0.000%	0.002%	0.003%	0.000%	0.000%	0.003%	0.004%
Mngmt of Co., Enterprises	0.000%	0.001%	0.002%	0.003%	0.000%	0.000%	0.003%	0.004%
Admin, Waste Services	0.001%	0.001%	0.002%	0.004%	0.000%	0.000%	0.004%	0.005%
Educational Services	0.001%	0.001%	0.002%	0.003%	0.002%	0.002%	0.005%	0.006%
Health Care, Social Asst	0.000%	0.000%	0.002%	0.002%	0.000%	0.000%	0.003%	0.003%
Arts, Entertain., Recreation	0.001%	0.001%	0.003%	0.005%	0.000%	0.000%	0.006%	0.007%
Accom, Food Services	0.001%	0.001%	0.002%	0.003%	0.000%	0.000%	0.004%	0.005%
Other Services (excl Gov)	0.001%	0.001%	0.003%	0.004%	0.000%	0.000%	0.005%	0.006%

Changes in production costs will affect prices of goods sold locally. The relative delivered price of a good is based on its production cost and the transportation cost of delivering the good to where it is consumed or used. The average price of a good at the place of use reflects prices of the good produced locally and imported elsewhere. Table 11 shows the impacts on prices (in terms of percentage change) by industry relative to its counterpart in the rest of the U.S. for PR 2449 and the base case. The construction industry is projected to face higher increases in prices than the rest of the industries because 72 percent of the affected 1,300 off-road engines belong to the construction industry. The impacts on prices are more similar between PR 2449 and the base case in later than earlier (2008-2011) years. The 2008-2011 price impacts are also more concentrated in a few industries under SOON than under the base case. The construction industry has the highest percentage increase in delivered prices, which is, for example, approximately 0.02 percent relative to its counterpart in the rest of the U.S. in 2022.

Table 11
Scenario 1: Impact on Delivered Prices by Industry

Industry	SOON				Base Case			
	2009	2011	2019	2022	2009	2011	2019	2022
Forestry, Fishing, Other	0.000%	0.000%	0.000%	0.000%	0.000%	0.000%	0.001%	0.000%
Mining	0.001%	0.001%	0.004%	0.007%	0.000%	0.000%	0.007%	0.007%
Utilities	0.002%	0.002%	0.007%	0.012%	0.000%	0.000%	0.013%	0.012%
Construction	0.003%	0.004%	0.012%	0.020%	0.000%	0.000%	0.023%	0.022%
Manufacturing	0.000%	0.000%	0.001%	0.002%	0.000%	0.000%	0.002%	0.002%
Wholesale Trade	0.000%	0.000%	0.001%	0.002%	0.000%	0.000%	0.002%	0.002%
Retail Trade	0.001%	0.001%	0.002%	0.004%	0.000%	0.000%	0.004%	0.004%
Transp., Warehousing	0.000%	0.000%	0.001%	0.002%	0.001%	0.001%	0.002%	0.002%
Information	0.001%	0.001%	0.003%	0.004%	0.000%	0.000%	0.005%	0.004%
Finance, Insurance	0.001%	0.001%	0.002%	0.004%	0.000%	0.000%	0.004%	0.004%
Real Estate, Rental, Leasing	0.001%	0.001%	0.006%	0.009%	0.000%	-0.001%	0.010%	0.009%
Profess, Tech Services	0.000%	0.000%	0.002%	0.003%	0.000%	0.000%	0.003%	0.003%
Mngmt of Co, Enterprises	0.000%	0.000%	0.002%	0.002%	0.000%	0.000%	0.003%	0.002%
Admin, Waste Services	0.001%	0.001%	0.002%	0.004%	0.000%	0.000%	0.004%	0.004%
Educational Services	0.000%	0.001%	0.002%	0.003%	0.002%	0.002%	0.004%	0.004%
Health Care, Social Asst	0.000%	0.000%	0.002%	0.002%	0.000%	0.000%	0.002%	0.002%
Arts, Entertain., Recreation	0.001%	0.001%	0.003%	0.005%	0.000%	0.000%	0.006%	0.005%
Accom, Food Services	0.000%	0.001%	0.002%	0.003%	0.000%	0.000%	0.003%	0.003%
Other Services (excl Gov)	0.001%	0.001%	0.003%	0.004%	0.000%	0.000%	0.004%	0.004%

Competitiveness Impact of Scenario 2

Table 12 shows the impacts on the cost of production by industry. The impacts are larger in later than earlier (2008-2011) years because the affected industries will have to pay the incremental repowering cost on their own in order to comply with the CARB off-road regulation. The increase in the cost of production is more concentrated in a few industries in earlier years under SOON than under the base case. The industries with higher cost impacts tend to have relatively large increases in the cost of production. It is projected that the highest increase in the cost of production would occur in the mining industry at approximately 0.03 percent relative to its counterpart in the rest of the U.S. in 2019.

Table 12
Scenario 2: Impact on the Cost of Production by Industry

Industry	SOON				Base Case			
	2009	2011	2019	2022	2009	2011	2019	2022
Forestry, Fishing, Other	0.000%	0.000%	0.001%	0.002%	0.000%	0.000%	0.002%	0.002%
Mining	0.002%	0.002%	0.015%	0.028%	0.000%	0.000%	0.029%	0.027%
Utilities	0.001%	0.001%	0.007%	0.013%	0.000%	0.000%	0.014%	0.013%
Construction	0.001%	0.001%	0.009%	0.017%	0.000%	0.000%	0.018%	0.017%
Manufacturing	0.000%	0.000%	0.001%	0.002%	0.000%	0.000%	0.002%	0.002%
Wholesale Trade	0.000%	0.000%	0.001%	0.002%	0.000%	0.000%	0.002%	0.002%
Retail Trade	0.000%	0.000%	0.002%	0.003%	0.000%	0.000%	0.003%	0.003%
Transp, Warehousing	0.000%	0.000%	0.001%	0.002%	0.002%	0.002%	0.002%	0.002%
Information	0.000%	0.000%	0.003%	0.005%	0.000%	0.000%	0.005%	0.005%
Finance, Insurance	0.000%	0.000%	0.002%	0.003%	0.000%	0.000%	0.004%	0.003%
Real Estate, Rental, Leasing	0.000%	0.000%	0.004%	0.008%	0.000%	-0.001%	0.008%	0.007%
Profess, Tech Services	0.000%	0.000%	0.002%	0.002%	0.000%	0.000%	0.003%	0.002%
Mngmt of Co., Enterprises	0.000%	0.000%	0.001%	0.002%	0.000%	0.000%	0.002%	0.002%
Admin, Waste Services	0.000%	0.000%	0.002%	0.003%	0.000%	0.000%	0.003%	0.003%
Educational Services	0.000%	0.000%	0.002%	0.003%	0.002%	0.002%	0.005%	0.004%
Health Care, Social Asst	0.000%	0.000%	0.001%	0.002%	0.000%	0.000%	0.002%	0.002%
Arts, Entertain., Recreation	0.000%	0.000%	0.003%	0.004%	0.000%	0.000%	0.005%	0.004%
Accom, Food Services	0.000%	0.000%	0.002%	0.003%	0.000%	0.000%	0.003%	0.003%
Other Services (excl Gov)	0.000%	0.000%	0.002%	0.004%	0.000%	0.000%	0.004%	0.003%

Table 13 shows the impacts on prices (in terms of percentage change) by industry relative to its counterpart in the rest of the U.S. for PR 2449 and the base case. The construction industry is projected to face higher increases in prices than the rest of the industries because 72 percent of the affected 1,300 off-road engines belong to the construction industry. The impacts on prices are similar between PR 2449 and the base case. The construction industry has the highest percentage increase in delivered prices, which is approximately 0.02 percent relative to its counterpart in the rest of the U.S. in 2019.

Table 13
Scenario 2: Impact on Delivered Prices by Industry

Industry	SOON				Base Case			
	2009	2011	2019	2022	2009	2011	2019	2022
Forestry, Fishing, Other	0.000%	0.000%	0.000%	0.000%	0.000%	0.000%	0.000%	0.000%
Mining	0.000%	0.000%	0.003%	0.006%	0.000%	0.000%	0.006%	0.005%
Utilities	0.001%	0.000%	0.006%	0.010%	0.000%	0.000%	0.011%	0.010%
Construction	0.001%	0.001%	0.009%	0.017%	0.000%	0.000%	0.018%	0.017%
Manufacturing	0.000%	0.000%	0.001%	0.001%	0.000%	0.000%	0.002%	0.001%
Wholesale Trade	0.000%	0.000%	0.001%	0.002%	0.000%	0.000%	0.002%	0.002%
Retail Trade	0.000%	0.000%	0.002%	0.003%	0.000%	0.000%	0.003%	0.003%
Transp., Warehousing	0.000%	0.000%	0.001%	0.001%	0.001%	0.001%	0.001%	0.001%
Information	0.000%	0.000%	0.002%	0.004%	0.000%	0.000%	0.004%	0.004%
Finance, Insurance	0.000%	0.000%	0.002%	0.003%	0.000%	0.000%	0.003%	0.003%
Real Estate, Rental, Leasing	0.000%	0.000%	0.004%	0.008%	0.000%	-0.001%	0.008%	0.007%
Profess, Tech Services	0.000%	0.000%	0.001%	0.002%	0.000%	0.000%	0.002%	0.002%
Mngmt of Co, Enterprises	0.000%	0.000%	0.001%	0.002%	0.000%	0.000%	0.002%	0.002%
Admin, Waste Services	0.000%	0.000%	0.002%	0.003%	0.000%	0.000%	0.003%	0.003%
Educational Services	0.000%	0.000%	0.002%	0.002%	0.002%	0.002%	0.004%	0.003%
Health Care, Social Asst	0.000%	0.000%	0.001%	0.002%	0.000%	0.000%	0.002%	0.002%
Arts, Entertain., Recreation	0.000%	0.000%	0.003%	0.004%	0.000%	0.000%	0.005%	0.004%
Accom, Food Services	0.000%	0.000%	0.002%	0.003%	0.000%	0.000%	0.003%	0.002%
Other Services (excl Gov)	0.000%	0.000%	0.002%	0.003%	0.000%	0.000%	0.004%	0.003%

FLEET SPECIFIC ANALYSIS

To investigate the economic effects of the SOON program on individual fleets, fleet data for 18 fleets over 20,000 hp was used to determine the difference in compliance costs with and without implementation of PR 2449. The fleet data was obtained from CARB surveys and is the same information used by CARB to estimate the economic and air quality impacts of their in-use off-road diesel equipment regulation (ARB, 2007a). The fleet characteristics varied considerably and are expected to adequately represent the characteristics of most fleets subject to the requirements of the SOON Program. The fleets' total horsepower ranged from just over 20,000 to 211,000 hp, and the average horsepower ranged from approximately 120hp to almost 500hp. The average fleet ages ranged from 7 to 21 years, and their equipment count ranged from a low of 69 vehicles to a high of 1100 vehicles. Specific characteristics of each fleet utilized in this analysis are shown in Table 14.

Table 14
Fleet Characteristics for SOON Program Analysis

Fleet	Vehicle Count	Average Age	Average HP	Total HP
1	1046	11.6	201.9	211,174
2	663	9.4	274.6	182,073
3	758	6.7	240.0	181,927
4	296	17.2	464.5	137,496
5	288	13.5	469.9	135,327
6	1100	13.3	117.3	129,070
7	229	13.2	497.1	113,847
8	904	11.1	121.5	109,816
9	223	13.4	472.9	105,455
10	289	7.8	281.3	81,307
11	242	13.0	325.2	78,694
12	320	10.8	150.7	48,216
13	114	19.1	419.9	47,867
14	101	19.4	413.5	41,759
15	88	20.8	416.3	36,633
16	101	19.0	350.2	35,368
17	69	18.1	407.9	28,145
18	160	10.2	135.7	21,716

Each fleet was modeled using two scenarios. The first scenario modeled the fleet's compliance actions needed to meet the requirements of CARB's base regulation. The second scenario modeled the fleet's compliance actions needed to meet the requirements of the SOON Program. Fleet actions were kept consistent by following an actions protocol based on most likely fleet actions. For example, the oldest vehicles are the first vehicles turned over to meet the NOx requirements of the regulation and the newest vehicles are retrofitted first to meet the PM requirements of the regulation. Additionally, to more realistically model the fleet actions, each fleet on average was assumed to receive funding and to implement a total of approximately 4,000 hp of SOON projects. While the SOON program requires fleets to submit applications for a sufficient number of projects to meet the more stringent SOON NOx targets, it is expected that a smaller number of projects will be funded. Analysis indicates that approximately 1300 engines or about 500,000 hp will need to be repowered or replaced to meet the 12 TPD of NOx reduction goal of the SOON program. With the largest 100 to 150 SOON eligible fleets operating in the district, it is anticipated that on average each fleet will receive SOON funding for approximately 4,000 hp of projects, which was assumed for this analysis.

In both scenarios, the fleets' vehicles were tracked each year from 2009 through 2021 (the end of the regulation) and actions taken on each vehicle were recorded. Costs associated with each action were calculated using the same assumptions for new vehicle costs, repowering costs, and retrofit costs as those used by CARB in their analysis (e.g. $270 per horsepower total repower costs) (ARB, 2007b). SOON projects were funded at the repower costs (i.e. vehicles under 250 hp were assumed to be replaced new, but SOON funding was estimated at $230/hp). The repowering and retrofit costs are consistent with those seen in the most recent Moyer

applications for this type of equipment. Each fleet's compliance cost for each scenario (with and without the SOON program implemented) were then summed across three ranges of years (2009-2012, 2013-2016, and 2017-2021) and compared. The first range (2009-2012) corresponds to the initiation of SOON funded projects. The middle range (20013-2016) corresponds to SOON contract period where all SOON funded engines are assumed to be emitting at their pre-modified emission levels for the purposes of complying with the base regulation requirements. The last range (2017-2021) corresponds to the end of the SOON contract period and the SOON engines re-enter the fleet and their actual emission rate can be used to determine compliance with the base regulation.

The results for each fleet are shown in Tables 15 and 16 below. Table 15 shows the percent difference between the cost to the fleet for the SOON scenario and the base scenario. A positive number indicates that the SOON scenario showed higher costs for that period. Similarly, Table 16 shows the effects on the fleets in terms of the estimated costs (not the percent difference) the fleet would incur for each scenario. Both tables show that in the early year range, almost all of the fleets show higher compliance costs associated with the SOON Program (as represented by the positive percent and cost differences). Much of this cost increase can be attributed to the 15 percent co-pay requirement of the SOON funding. If this cost is considered part of the normal business practices, then the cost differences in the earliest years are not significant for many of the fleets. For the middle year range, the cost differences are substantially higher and under the SOON scenario almost all fleets see increased costs when compared to non-SOON scenario run. This is consistent with the design of the SOON program in that SOON funded vehicles must be assumed to remain at their pre-modified emission levels for the life of the SOON contract to ensure that the base regulation will obtain the expected emission reductions. This quirement would also result in additional NOx reductions from the SOON Program to meet the Basin's attainment needs. In addition, this may appear to result in fleets having to identify additional vehicles to meet the base regulation in this timeframe. However, in the later year time frame (2017-2021) most fleets show a reduction in compliance costs as the SOON funded vehicle's contract ends and the vehicle's actual emission rate is used to determine the fleets' compliance with the base regulation. Almost all fleets see a significant cost reduction in the later years that results in an overall cost savings over the life of the regulation, demonstrating that the SOON Program will actually benefit the fleets and reduce their cost of complying with CARB's base regulation.

While a small number of fleets appear to realize increased costs associated with the SOON Program over the life of the regulation, it must be emphasized that these results are based on one possible compliance pathway for each fleet, and that many pathways are available to the fleets due to the flexibility inherent in the regulation. Staff believes that for the fleets that showed a SOON Program cost increase, an alternative approach could be taken that would show a benefit similar to that demonstrated by the other fleets in this analysis. To summarize, in almost all cases staff believes that the SOON Program implemented by PR 2449 will result in an overall cost savings and an overall benefit to fleets subjected to the SOON requirements.

Table 15
Percent Cost Difference
[(SOON – Base)/(Base)]

Fleet	Average Age	Size (#)	Size (hp)	Average (hp)	Percent Cost Difference of SOON Program			
					2009-2012	20013-2016	2017-2021	Total Cost
1	12.1	1046	211174	202	0.52%	1.23%	-2.74%	-0.35%
2	9.7	663	182073	275	-3.12%	0.24%	-3.04%	-2.06%
3	7.2	758	181927	240	-2.16%	18.11%	-6.38%	0.68%
4	17.2	296	137496	465	3.49%	4.54%	-8.32%	-1.33%
5	14	288	135327	470	2.90%	4.52%	-17.70%	-1.92%
6	13.3	1100	129070	117	1.75%	-0.30%	1.36%	0.85%
7	12.3	229	113847	497	4.13%	8.20%	-23.39%	-2.69%
8	10.9	904	109816	121	4.44%	1.03%	-16.62%	-3.14%
9	14	223	105455	473	3.25%	6.05%	-15.94%	-1.11%
10	8.3	289	81307	281	-2.59%	18.72%	-6.40%	1.80%
11	12.1	242	78694	325	1.73%	12.83%	-18.35%	-1.76%
12	10.4	320	48216	151	-2.75%	-10.63%	-9.24%	-6.95%
13	19.5	114	47867	420	7.44%	4.41%	-29.27%	-6.83%
14	19.9	101	41759	413	15.13%	1.73%	-29.30%	-5.72%
15	21.2	88	36633	416	14.58%	2.65%	-29.09%	-6.36%
16	21.1	101	35368	350	6.52%	9.52%	-42.30%	-5.85%
17	18.5	69	28145	408	4.80%	51.39%	-60.42%	-1.51%
18	10.7	160	21716	136	22.29%	12.70%	-24.35%	-0.03%

Table 16
Costs Comparison of SOON and Base Scenarios

Fleet	Average Age	Size (#)	Size (hp)	Average hp	2009-2012			20013-2016			2017-2021			Grand Total Diff
					BASE	SOON	DIFF	BASE	SOON	DIFF	BASE	SOON	DIFF	
1	12.1	1046	211174	202	$28.55	$28.70	$0.15	$31.71	$32.10	$0.39	$31.27	$30.42	-$0.86	-$0.32
2	9.7	663	182073	275	$18.05	$17.49	-$0.56	$16.60	$16.64	$0.04	$19.44	$18.85	-$0.59	-$1.11
3	7.2	758	181927	240	$18.47	$18.07	-$0.40	$13.94	$16.46	$2.52	$26.98	$25.26	-$1.72	$0.40
4	17.2	296	137496	465	$4.91	$5.08	$0.17	$10.01	$10.46	$0.45	$11.80	$10.82	-$0.98	-$0.36
5	14	288	135327	470	$7.75	$7.98	$0.23	$8.58	$8.97	$0.39	$5.87	$4.83	-$1.04	-$0.43
6	13.3	1100	129070	117	$26.69	$27.16	$0.47	$32.49	$32.40	-$0.10	$26.17	$26.53	$0.36	$0.73
7	12.3	229	113847	497	$8.31	$8.65	$0.34	$5.77	$6.24	$0.47	$5.77	$4.42	-$1.35	-$0.53
8	10.9	904	109816	121	$21.15	$22.09	$0.94	$24.95	$25.21	$0.26	$19.62	$16.36	-$3.26	-$2.06
9	14	223	105455	473	$6.36	$6.57	$0.21	$6.70	$7.11	$0.41	$5.11	$4.30	-$0.81	-$0.20
10	8.3	289	81307	281	$8.29	$8.07	-$0.21	$6.44	$7.65	$1.21	$8.84	$8.28	-$0.57	$0.43
11	12.1	242	78694	325	$7.53	$7.66	$0.13	$5.06	$5.71	$0.65	$6.03	$4.92	-$1.11	-$0.33
12	10.4	320	48216	151	$9.63	$9.20	-$0.43	$7.38	$6.06	-$1.33	$6.76	$6.22	-$0.54	-$2.29
13	19.5	114	47867	420	$2.20	$2.36	$0.16	$3.40	$3.55	$0.15	$3.10	$2.19	-$0.91	-$0.59
14	19.9	101	41759	413	$1.86	$2.14	$0.28	$2.96	$3.01	$0.05	$2.58	$1.82	-$0.76	-$0.42
15	21.2	88	36633	416	$1.65	$1.89	$0.24	$2.59	$2.66	$0.07	$2.55	$1.81	-$0.74	-$0.43
16	21.1	101	35368	350	$2.52	$2.68	$0.16	$2.96	$3.24	$0.28	$2.10	$1.21	-$0.89	-$0.44
17	18.5	69	28145	408	$6.74	$7.07	$0.32	$2.76	$4.18	$1.42	$3.20	$1.27	-$1.93	-$0.19
18	10.7	160	21716	136	$5.96	$7.29	$1.33	$9.07	$10.22	$1.15	$10.22	$7.73	-$2.49	-$0.01
Totals					$186.62	$190.15	$3.53	$193.37	$201.85	$8.48	$197.42	$177.23	-$20.19	-$8.18

NECESSITY TO ADOPT THE RULE TO ATTAIN FEDERAL STANDARDS

Proposed Rule 2449 will implement the SOON provision of the State regulation for in-use off-road diesel vehicles. The SOON Program is one of the control measures in the California 2007 State Implementation Plan for the South Coast Air Basin (Basin). The emission reductions from the SOON program are critical for achieving the federal annual PM2.5 ambient air quality standard by 2015 and the 8-hour ozone standard by 2024 in the Basin. Therefore, the adoption of PR 2449 is necessary for attaining the federal ambient air quality standards.

AVAILABILITY AND COST-EFFETVENESS OF ALTERNATIVES TO THE RULE

This report investigated the impacts on the affected industries with and without the SOON provisions being implemented. In each case, the Moyer funding was used to achieve additional reductions in the AQMD. Under the SOON program (with $30 million Moyer incentive funding per year over 4 years), the cost-effectiveness is estimated at $5,000 per ton of NOx reduced. Without the SOON Program, the Moyer funding will be used for other on-road and off-road projects with a cost-effectiveness of up to $16,000 per ton of NOx and PM reduced. However, the resulting emission reductions are not certain because of the voluntary nature of the traditional Moyer program, and therefore, there will not be any assurance that the needed emission reductions allocated to the SOON Program in the 2007 SIP will be achieved to meet the Basin's attainment needs. In contrast, under PR 2449, affected fleets would have to participate in the SOON Program and implement projects if awarded funding, thus providing assurance that the necessary NOx reductions attributed to this program will be achieved.

An additional alternative was also considered where the $30 million Moyer funding (per year over 4 years) would not be available. Under this alternative, without the incentive funding, the necessary emission reductions from the SOON Program will not be achieved which would result in shortfall of emission reductions needed to attain the federal PM2.5 ambient air quality standard. In addition to the unacceptable adverse health effects, failure to attain the federal standard could result in sanctions and loss of several billions of dollars of federal infrastructure funding. Therefore, this alternative is not a viable alternative. A number of other alternatives (including accelerated turnover of vehicles without public funding assistance) were also evaluated by CARB staff as part of the state regulation, which was found not to be feasible (CARB, 2007a).

RULE ADOPTION RELATIVE TO THE COST EFFECTIVENESS SCHEDULE

On October 14, 1994, the Governing Board adopted a resolution that requires staff to address whether rules being proposed for adoption are considered in the order of cost-effectiveness. The 2007 Air Quality Management Plan (AQMP) ranked, in the order of cost-effectiveness, all of the

proposed control measures for which costs were quantified. It is generally recommended that the most cost-effective actions be taken first.

PR 2449 would implement the SOON Program which is one of the control measures in the 2007 State Implementation Plan (SIP) adopted by CARB in September 2007, but not in the 2007 AQMP. However, the cost-effectiveness for this measure was not determined in the 2007 SIP since the measure was assumed to rely on public funding for implementation.

REFERENCES

California Air Resources Board (CARB). Second Notice of Public Availability of Modified Text of Additional Documents. Downloaded February 5, 2008 from http://www.arb.ca.gov/regact/2007/ordiesl07/ordiesl07.htm.

_____. Technical Support Document: Proposed Regulation for In-Use Off-Road Diesel Vehicles. Downloaded from http://www.arb.ca.gov/regact/2007/ordiesl07/TSD.pdf. 2007a.

_____. Appendix J to Technical Support Document: Proposed Regulation for In-Use Off-Road Diesel Vehicles. Downloaded from http://www.arb.ca.gov/regact/2007/ordiesl07/tsdappj.pdf. 2007b.

Los Angeles County Farm Bureau. 2005 Crop and Livestock Report. Palmdale, California. 2006.

Orange County Farm Bureau. 2005 Orange County Crop Report. Anaheim, California. 2006.

Prime Rate, Fed Funds, COFI. Downloaded February 13, 2008 from http://www.bankrate.com/brm/ratewatch/leading-rates.asp.

Regional Economic Modeling Inc. (REMI, 2007). Policy Insight® for the South Coast Region (70 sector model). Version 9.5.22.

Regional Economic Modeling Inc. (REMI, 2006). Policy Insight® for the South Coast Region (70 sector model). Version 9.0.3.

Riverside County Farm Bureau. 2005 Agricultural Production Report. Moreno Valley, California. 2006.

San Bernardino County Farm Bureau. 2005 Crop and Livestock Report. Rialto, California. 2006.

South Coast Air Quality Management District. Draft Socioeconomic Report for Proposed Rule 3503—Emissions Inventory and Health Risk Assessment for Railroads. October 2005.